

Development and Implementation of the Bulk Overwrap Bag for Food Stowage on the International Space Station

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The Bulk Overwrap Bag (figure 1)—or BOB, as it is affectionately known in NASA Johnson Space Center’s Space Food Systems Laboratory—was originally conceived as part of the Advanced Food Technology project. NASA’s Constellation Program’s Orion vehicle was oversubscribed on mass, so scientists had to develop a lighter-in-weight alternative to the metal food containers used on the Space Shuttle Program’s Space Transportation System (STS) and on the International Space Station (ISS) for stowing food on Orion. Additionally, the container was required to be reconfigurable to fit irregularly sized stowage spaces. This requirement led to the idea of a flexible bag, which in turn led to the initial version of the BOB.

Background of Food Stowage

During the “three crew” operational period on the ISS, all food preparation and dining was done in the Russian Service Module (SM). The SM has a rehydration station for adding water to foods and beverages, as well as a dining table. In proximity to the dining table is a rack that is sized to hold the Russian food containers. In addition to fitting in the SM rack, the Progress resupply vehicle also has racks designed to accommodate these food containers. The United States reverse engineered a collapsible food container from the Russian design to ensure that the U.S.-built container would fit in the SM and Progress racks. This U.S. Collapsible Food Container (figure 2) was the principal method for stowing food to be launched to the ISS. These collapsible containers were returned via the shuttle, mostly on Multi-Purpose Logistics Module flights, and refurbished for reuse.

The ability to return and reuse containers would end with the Space Shuttle Program. The ISS Program had to make a decision regarding food containers. Should more of the collapsible food containers be built and burned up as trash after use, or should an alternative method for food stowage be found? The Space Food Systems Laboratory proposed implementation of the BOB concept for use on the ISS, and the ISS Program accepted that proposal.



Fig. 1. Bulk Overwrap Bag (BOB).

Adaptation of the Bulk Overwrap Bag Concept

The BOB design had to be modified slightly for use on the ISS. The first modification was to size the BOB to hold the same amount of food as a collapsible food container. The usage rate of food on the ISS is carefully tracked. Having the quantity of food in a BOB equivalent to that of a collapsible food container would greatly facilitate that tracking process. In addition, NASA personnel developed a rigid framework to hold the empty BOB during packing to provide a template for the technicians packing food into the bags. This ensured consistent width and height of the packed BOBs. The labeling and bar coding system used on the collapsible food containers also had to be modified to work with the BOBs. Food lab personnel had to work with the ISS Stowage Team to determine a plan for stowing BOBs for launch to orbit. Finally, NASA developed an on-orbit operational scenario for the BOBs.

Implementation of Bulk Overwrap Bags

The first BOB of food arrived on the ISS with the docking of Japanese H-II Transfer Vehicle in January 2011. Since food on the ISS is used on a first-in, first-out basis, actual use of the packed BOBs of food will begin to occur



Fig. 2. US Collapsible Food Container.

gradually as the supply of standard menu food packed in collapsible containers is depleted. Feedback on the operational use of the BOBs will be forthcoming as ISS crew members who have used the BOBs on orbit return to Earth and participate in post-increment food debriefs. The average weight of a packed BOB of food is 5.0 kg (11 lbs) versus the 6.0 kg (13.2 lbs) average weight of a packed collapsible food container. This represents a significant savings in up mass for the ISS Program. For instance, the use of the BOB on STS-135/ULF7 (Utilization and Logistics Flight) resulted in approximately 240 kg (~529 lbs) of up mass savings on that flight alone. These up mass savings obviously allow for additional cargo to support other activities, such as science experiments, to be launched to the ISS.

Future of the Bulk Overwrap Bag

Space Food Systems Laboratory personnel view the BOB as a work in progress. Lab personnel will be listening to feedback from crew members for ideas on improving the BOB. Also, the team has some ideas in development for “continuous improvement” of the BOB concept.